Editorial & Publishing Offices :
MACMILLAN & CO., LTD.
ST. MARTIN'S STREET
LONDON, W.C.2

Telegraphic Address :
PHUSIS, LESQUARE, LONDON

Telephone Number :
WHITEHALL 8831

Vol. 144 SATURDAY, JULY 29, 1939 No. 3639

WHITE SETTLEMENT IN THE TROPICS

IT is now more than a century since Sir Samuel Baker recorded his lamentable failure to establish an English country gentleman's estate on the grassy plains of the heart of Ceylon. His pedigree cattle and sheep soon succumbed and his carefully selected wheat and oats showed early promise, but failed to come to harvest. No less concerned was his coachman at the death of his carriage horses; with characteristic though misplaced resource, he sought to uphold his master's dignity by teaching an elephant to trot gracefully and so to replace the missing horses. He succeeded only in driving a fine elephant to death. Since then, many advances have been made in the knowledge of tropical agriculture, yet many of the major problems of white settlement in the tropics and acclimatization to tropical environments remain unsolved.

The problem of finding areas for large-scale settlement of mid-European refugees has thrown into prominence the need for more accurate knowledge of many of the more sparsely peopled areas of the earth's surface. Those that remain little known are mainly in the tropics. In particular, attention has been focused on British Guiana—in latitude but a few degrees from the equator and thus not very different from the scene of Baker's experiments in Ceylon, and at comparable elevations. In the latter part of 1938, the British Government made a tentative offer of lands in British Guiana as a possible site for the settlement of involuntary refugees created by recent events in Europe. An impartial international commission to investigate these areas was appointed by the President of the United States through the Advisory Committee on Political Refugees. The Commission was a strong one, including members with expert knowledge of health, engineering, colonization, tropical agriculture, soils and malarial control and, with the aid of air reconnaissance, it carried out in the short period February 14 to the early part of April 1939 a remarkable series of journeys, and has presented, with commendable speed, a general report*. A number of appendixes have been grouped together and published† separately, including an important note on the "Possibilities of Agricultural Settlement" by Sir Geoffrey Evans, formerly principal of the Imperial College of Tropical Agriculture at Trinidad.

British Guiana has an area of 89,480 square miles and a population of about 325,000, but the people are concentrated on the sugar and rice lands of the coastal lowlands. The vast interior is virtually uninhabited, save for scattered Indian settlements, mainly in reservations, and occasional mining camps or cattle ranches. The two main areas examined were both south of lat. 5° N.—that is, less than five degrees from the equator—and covered about 30,000 square miles on either side of the Essequibo River. The bulk is covered with dense forest; about one eighth is grassland.

The Commission summarizes its findings by expressing the "opinion that, while the territory is not an ideal place for refugees from Middle European countries, and, while the territory could not be considered suitable for *immediate* large scale settlement, it undoubtedly possesses potential possibilities that would fully justify the carrying out of a trial settlement project on a substantial enough scale that would make it possible to determine whether and how these potential possibilities could be realized".

* Cmd. 6014. (London: H.M. Stationery Office, 1939.) 4*d.* net.
† Cmd. 6029. (London: H.M. Stationery Office, 1939.) 2*s.* net.

This is a very guarded statement, and the plan recommended is for receiving camps and trial settlements, directed by properly equipped technical organizations, to be set up at properly chosen locations for some 3,000–5,000 carefully selected young men and women at a cost of about 3,000,000 dollars. The cost is given as a rough figure to be accepted with caution.

It is from Sir Geoffrey Evans's appendix that some clear indications of the possibilities are to be obtained. He emphasizes that the utilization of the open savannah country is essentially a pastoral problem, and that much of the forest country has the light, sandy, easily eroded and easily leached soils common to many of the hot, wet-forest regions of the world. The only areas capable of supporting a permanent agriculture are valley lands of unknown extent in the Kanuku mountains. A difficulty exists that large sections of the savannah country are flooded in the wet season, and drainage might be needed for health reasons; on the other hand, the areas liable to flood seem to support the best pasture. What is envisaged is a compact village community, raising by its own labour subsistence crops on the valley lands, managing cattle on neighbouring savannahs, and thus having not only an assured meat supply but also being able to sell to timber-working communities to be set up in the forest areas, and perhaps to feed a meat packing plant. The scheme incidentally involves the utilization by Europeans of unaccustomed tropical plants as the basis of diet.

It is interesting to note the insistence on the inherent poverty of many, perhaps most, tropical soils; an insistence emphasized by recent work in tropical Australia. There, in complete contrast to the patriotic optimism of only a decade ago, agriculturally utilizable soils have been stated recently to occupy not more than 5,000 acres in the 335,116,800 acres of the Northern Territory. Since the financing of private enterprise in this territory is obviously a concern of the great banks, the Bank of New South Wales recently commissioned Mr. A. G. Lowndes to make detailed investigations on the spot, and then to compare conditions in North Africa, Brazil and other comparable areas. His findings are pessimistic in the extreme: "Beyond the present limits of agricultural settlement, Australia has practically no areas which are definitely known to be suitable for close settlement".

The appearance of the Commission's report postdates by a few weeks the publication as a special monograph of the American Geographical Society of what is really the first comprehensive scientific study of white settlement in the tropics*. The author, Dr. Price, is an Australian with a very wide experience of tropical Australia, who has made detailed studies in many parts of the world but notably in the West Indies. He emphasizes the contradictory views which are held by leading authorites even at the present time. Andrew Balfour summarized the conclusions reached after a lifetime's work on tropical diseases thus: "so far as the race is concerned, I am persuaded that the hot and humid tropics are not suited to white colonization and never will be with our present knowledge, even if they are rendered as free from disease as England". At the other extreme are those whose views are coloured by the amazing success of General Gorgas in Panama and epitomized by Guiteras in his study of Cuba: "the tropical climate is compatible with the most elevated manifestations of human activity, and the acclimatization of the white race to the tropics has been effected with complete success".

Price entitles one of his chapters "British Failures in the West Indies"; but is careful to show that the long and dismal record throws little light on the effect of climate *per se*. The scientific invaders of the tropics still face three great obstacles: disease, which can and has largely been conquered, the coloured races, a condition which can be eliminated, and climate, the unsolved problem. It is rightfully pointed out that the effects of climate can be studied only in part in the laboratory owing to the interaction of sociological, psychological and other factors in real life. Despite the most adverse conditions, small white groups have maintained a remarkable standard, notably on the little island of Saba in the West Indies, and Price agrees with R. R. Platt that failures in Central and South America are due to isolation rather than to climate.

So far there is nothing in the historical record to negative the possibilities of settlement in British Guiana with the safeguards envisaged by the Commission. The admitted dangers of disease, ignorance, isolation and racial conflict are to be removed as largely as possible. Contrary to long-held popular belief, medical opinion agrees that manual labour is not only possible but even essential. Provided the soils prove capable of

* White Settlers in the Tropics. By A. Grenfell Price, with additional Notes by Robert G. Stone. (American Geographical Society, Special Publication No. 23.) Pp. xiii+311+20 plates. (New York: American Geographical Society, 1939.) 4 dollars.

supporting an adequate agriculture, the unknown factor is still, in the main, climate. Ellsworth Huntington contends that there are climatic limits and optima for human beings as for all other forms of life, and that the tropics are beyond the climatic optima and near the climatic limits for whites. In a series of long and detailed appendixes to Price's work, Mr. Robert G. Stone, of Harvard, has summarized the present state of knowledge. There are definite physiological changes of temporary and possibly permanent character produced in white peoples by a tropical environment; the real test must come in the second and third generations.

THE IMPACT OF CHRISTIANITY ON SOCIAL AND ECONOMIC LIFE

Christianity and Morals

By Prof. Edward Westermarck. Pp. xvi + 427. (London: Kegan Paul and Co., Ltd., 1939.) 21*s.* net.

PROF. E. WESTERMARCK requires no introduction to the reader; his earlier works on ethics and sociology are well known, and anything that he says commands attention and respect. Several of his previous books have an important bearing on the present volume and in two of these, "The Origin and Development of the Moral Ideas", and "Ethical Relativity", he states his objections to the view of Rashdall and others on the objective validity of moral judgments. The present reviewer dealt with this subject less than two years ago in "Free Will or Determinism", and though his line of attack was somewhat different from that of Westermarck, his conclusions were the same, that belief in the objectivity of our moral judgments is untenable. In "Ethical Relativity", Westermarck argues that the predicates of all moral judgments, all moral concepts, are ultimately based on emotions. There are two moral emotions—moral approval and moral disapproval; the first of these is a form of retributive kindly emotion, and the second is a form of resentment. They are characterized as *moral* emotions, as distinguished from *non-moral* emotions, by the fact of disinterestedness.

In Chapter iii of the present work Westermarck shows that the ethics of Jesus are of a retributive character. It is difficult to read the synoptic gospels without agreeing with this view (John's gospel is in a different category, as few of the actual sayings of Jesus are recorded there). The moral teaching of Jesus is undoubtedly permeated with the principle of rewards and punishments. Although egoistic hedonism has usually been repulsive to the moral consciousness, yet it can have a plausible appearance, and Sidgwick recognizes it as an inevitable element in a complete system of ethics. He defines egoistic hedonism as "a system which prescribes actions as means to the end of the individual's happiness or pleasure". This differs considerably from the egoistic hedonism of the Cyrenaics and Epicureans, and there is nothing in the teaching of Jesus which is contradictory to this definition. In Chapters iv and v it is shown that the teaching of Jesus also emphasizes the disinterested and altruistic character of the moral emotions, and here we see the feature that distinguishes them from other, non-moral, retributive emotions. The Golden Rule brings this out very clearly, although it should be pointed out that this Rule is older than Christianity, and in its negative form is widespread.

There is a very marked contrast between the teachings of Jesus and of Paul. According to Paul, salvation is not a reward for righteous conduct, as Jesus taught, but is entirely dependent on divine grace, "through the redemption that is in Christ Jesus". His doctrine of justification by faith was accepted by the Church from the days of St. Augustine, though Catholicism has always recognized the meritoriousness of good works. The denial of this and the trust in justification by faith alone had very demoralizing effects amongst various Protestant sects, which even Luther himself was forced to admit and bewail. On p. 117 it is stated that Paul had imbibed from his Jewish upbringing the idea of all mankind doomed to death on account of Adam's sin. But the doctrine of 'evil impulse', not associated with the Adam story, was held in official and cultured scholastic Jewish circles, and there is much to commend the view of Dr. N. P. Williams, that the Adam story, held largely in backward Galilee where Jesus did most of his work, was adopted by Paul. This he did out of deference to those disciples, Peter in particular, who had seen Jesus in the flesh, and while it cannot be proved that Jesus in fact accepted the Adam story, yet in some of his sayings he appears to assume a sinful disposition inherent in man.

Nine chapters are devoted to a consideration of the impact of Christianity on ideas and conduct regarding the sanctity of human life (including warfare, infanticide and suicide), economics, slavery, regard for the truth, marriage, divorce, irregular sex relations, and consideration for the lower animals. It must be regretfully confessed that a large portion of this is an indictment of Christianity, and the Christian apologist will find it difficult to defend his position. It cannot be denied that the capitalist spirit influenced theological dogma, more especially in the sixteenth and seventeenth centuries. The attitude of Islam towards slaves contrasts favourably with that of Christianity, which was influenced by false Old Testament teaching. The personal independence enjoyed by the married woman under the later Roman law was lost through legislation influenced by Christianity. This personal independence was regained, not because of, but in spite of, the Churches. The opposition that the Christian Churches have raised against divorce, even when innocent people were living under conditions compared with which the lot of the slave was a happy one, will not be easily forgotten. Repentance in sackcloth and ashes may be a prerequisite for organized religion if it entertains any hope of moulding the future of Western civilization.

The work is extraordinarily interesting, and coming from one with Prof. Westermarck's reputation, will command a large reading public. It is a little surprising that "The Laws of England", by the Earl of Halsbury, published in 1911, should still be quoted relating to the present law of England on marriage, and that no mention should be made of recent legislation. M. D.

CO-OPERATION IN RESEARCH

Co-operation in Research

By Staff Members and Research Associates of the Carnegie Institution of Washington. (Publication No. 501.) Pp. ix + 782. (Washington, D.C.: Carnegie Institution, 1938.)

ON December 31, 1938, Dr. John Campbell Merriam retired from the presidency of the Carnegie Institution of Washington. The volume under review, with its intriguing title, has been written by his colleagues to express to President Merriam "the appreciation felt by the members and research associates of the Institution for his continued inspiring guidance of their work and for his stimulating personal interest in their problems". It is no small task to have directed, for eighteen years, the policy of a great research organization like the Carnegie Institution, and it is possible that, at the last assize, the holder of such an office may be found to have exerted as great an influence on human progress as leaders in other spheres of activity whose names are much more prominent in the pages of the daily press. In this spontaneous tribute from his colleagues, however, Dr. Merriam will, we are sure, find ample reward for his service to science, and through science to humanity.

Commemorative volumes are not invariably—perhaps not even usually—of much intrinsic importance; they tend to belong to the ephemera of literature. "Co-operation in Research" is one of the exceptions. In the first place the responsible committee wisely decided that the papers included should deal with current problems, and should epitomize the activities of the Institution in various branches of science. As there are few branches of science in which the Institution is not active, the volume serves as an admirable conspectus of the present state of knowledge in many fields, and its perusal is a liberal education. Water in geological processes, the surface of the moon, sunspots and stellar distances, universal aspects of atmospheric electricity, eighteen years of research on the gene, "What and Why is Leukemia?", the influence of nutrition on the chemical composition of the normal body, the substance of American history, race and class in Yucatan, ancient forests of Oregon; these are a few topics—chosen at random—to indicate the scope of the volume. Nor are the articles, in spite of their number, in the least superficial. Under the rule of Dr. Merriam, a piece of research was not considered finished until its results had been made available, not merely to the specialist in the subject itself but also to specialists in other subjects, and in their simplest form to the public at large. The articles in the present volume show that the members of Dr. Merriam's team have learned their job.

But the volume is something more than a record—it is a confession of faith. "Co-operation in Research" is the title of the book, and co-operation in research was the policy pursued by the Institution under the guidance of its chief. "Throughout his administration," says the foreword, "Dr. Merriam has stressed the need for co-operative attack on problems too large to be solved by a single observer, and has initiated many projects in which teamwork by different groups has been essential to success." The whole book is a tribute

to the vital importance of the method, and the individual papers demonstrate, better than pages of argument, the value of co-operative endeavour in science.

This testimony is timely. In large industrial research organizations, no doubt, active co-operation between scientific workers of differing trainings has been, or is being, largely achieved; with results which amply justify the by no means excessive sums spent on the work. Pure science, however, still lags woefully behind. It is by no means easy to break down the partition walls which separate the sciences, and to bring together in equal partnership and in the same laboratory men of different training. It calls for vision and courage; more essentially still, it needs money. Yet there can be little doubt that the next great advances in knowledge are waiting to be made in those neutral territories which separate science from science. In particular, the time is ripe for a mass invasion of the no-man's-land dividing physics from biology: a territory in which neither physicist nor biologist can walk in safety alone. Something is being done, but far less than the opportunity warrants. It is much to be hoped that the considered testimonies to the value of the method contained in this commemoration volume may provide a stimulus to still further efforts at co-operation in research.

J. A. CROWTHER.

SCIENCE, ART AND DESIGN

The Scientific Aspects of Artists' and Decorators' Materials

By Dr. R. S. Morrell. Pp. xi + 142. (London: Oxford University Press, 1939.) 5*s*. net.

THE studio of the medieval artist or craftsman was very much more than a place where pictures were painted or pots were fashioned. It combined the functions of workshop and laboratory for the master's own activities, and for the instruction of his pupils. A long apprenticeship was demanded of those whose ambition it was to become master-craftsmen, and much of this period seems to have been devoted to an intense and intimate study of materials, which included the preparation of pigments, and the application of sundry metallurgical principles such as those of metal refining and extraction. In a word, this was a hard school of training in the properties of matter, somewhat far removed apparently from Ruskin's vision of Giorgione as he appears in "The Two Boyhoods".

Farther north, the van Eycks had been experimenting with the behaviour of emulsions and colloids, an adventure which, like many another, led to no startling discovery, no mystic secret, but which produced in the end (after innumerable transitional techniques) the supreme achievement of the Netherlands—the perfection of oil painting.

Nevertheless, the course of man's attempts to obtain the mastery over matter is strewn with failures, instructive but none the less unfortunate. Seventeenth-century Italian pictures executed upon slate supports have revealed an oil film under the paint layer which has brought about disastrous lack of cohesion, with consequent flaking; and the sequelæ of Reynolds' love of bitumen are all too obvious in the havoc which has surely followed upon a lapse from a rigorous appreciation of the laws of physical chemistry.

In our day, a return is noticeable to an interest in materials as such, but the focus of attention is naturally different. The urge is first to understand and then to apply all the manifold new products which synthetic chemistry has provided. Coal-tar derivatives such as monastral blue, substances of high molecular weight like the polyvinyls, bakelite and the rest, are the bricks of which the twentieth-century edifice may be built, and become a thing of beauty.

But with such plenty, the student will ask, "Where shall wisdom be found?" Fortunately, in the modest little book now under review, he can turn to the results of long experience of a teacher and worker in natural science applied to the arts. Dr. Morrell discusses supports, grounds, pigments, lacquers and varnishes not only with clarity, but always with an eye upon the reader who has no intention of becoming a specialist in technological chemistry, but wants to understand the scientific aspect of everyday materials. Yet these pages are no mere compilation of useful properties; they contain a number of sidelights upon art history which are illuminating, as well as necessary for a scholar's appreciation of the development of technique.

In a contribution so excellent, critical comment can only be made with hesitation; yet it is this. The bibliography, adequate as it is up to a point, ignores completely the numerous papers on these very subjects which have been appearing in "Technical Studies" of Harvard University for the past seven years. It seems a grievous pity not to mention them, and perhaps still more, the

"Trial Data" from the same source. Further, no place is found for a reference to the comprehensive work of the Carnegie Institution of Washington on coloured minerals, fundamental for our knowledge of the optical characteristics of pigments. These researches have become international, the common property of artists and designers. But that Dr. Morrell's manual should receive the warmest of welcomes, there can be no doubt.

F. IAN G. RAWLINS.

PURE AND APPLIED THERMODYNAMICS

(1) A Textbook of Thermodynamics
By Dr. F. E. Hoare. Second edition. Pp. xii+307. (London: Edward Arnold and Co., 1938.) 15*s*. net.

(2) Applied Thermodynamics
By Prof. Virgil Moring Faires. (Engineering Science Series.) Pp. xvii+374. (New York: The Macmillan Company, 1938.) 17*s*. net.

(3) Elementary Thermodynamics
By Prof. Virgil Moring Faires. (Engineering Science Series.) Pp. xiii+225. (New York: The Macmillan Company, 1938.) 12*s*. net.

(1) DR. HOARE'S book, which deals with pure thermodynamics, is one of the most readable treatises yet published on a subject which is too frequently dealt with in a somewhat formidable manner. No attempt is made to evade difficulties, since although starting with comparatively elementary work, the final chapters work up to the use of the quantum theory and statistical mechanics. As an instance of the human touch, the author allows himself in connexion with Callendar's equations for steam the use of the word "surprising" when conducting the reader along the interlocking paths of this fascinating piece of work. A little more of this spirit in the past might have shortened the twenty years which elapsed between its enunciation and acceptance.

Rather more than the first half of the book is taken up with the development of the usual theorems, including change of phase, equilibrium of systems, and the Nernst heat theorem. The kinetic theory first appears in a formal manner in Chapter vi, necessitating a reference forward from Chapter ii to some of its results. Though rarely adopted, a more logical procedure would seem to be to introduce it at an early stage: an additional advantage would be that it renders so much elementary work self-evident.

The applications which follow, to solutions, electrical phenomena including the magneto-caloric effect, radiation and specific heats according to the quantum theory, at times naturally make rather heavier reading. Numerous very recent references to original work are supplied for those who wish to go into each subject more deeply than is possible in the 300 pages of this book. That this, a second edition, has been called for is an indication of the usefulness of the book, the value of which has been enhanced by a collection of examples at the end, with hints on working them out.

(2) As its title implies, the second book is of a very different type, and while not neglecting theory, deals largely with applications to machines. Half-tone illustrations form a feature comprising nearly a quarter of the 200 figures, but with the exception of the section giving examples of boilers and their auxiliaries, which is up to date and fairly comprehensive, in a few other instances better choice might perhaps have been made, even allowing for differences in practice between America and Great Britain.

The theoretical side is by no means of an elementary character and includes such points as variable specific heats in internal combustion engines, regenerative heating (or bleeding) in steam plant with a section on the use of mercury vapour, and various types of refrigerators, while heat transmission is not neglected.

In addition, it is difficult to think of any auxiliary apparatus connected with these branches of engineering which is not mentioned, sometimes in the form of a short piece of analytical work, at others as a practical note. Here and there one may not agree with the author; for example, a statement concerning the possible efficiency of the Still engine is certainly open to question.

A number of examples are worked out in the text. Altogether a useful book, linking theory and practice.

(3) Prof. Faires' other book is shorter, on the lines of (2) above, but with less application to practice: for example, most of the half-tone blocks have disappeared, and the reader will look in vain for details of boilers and turbines, the only feature of the latter dealt with being the flow through nozzles.

The author has resisted the temptation to condense his larger book, and has had the courage to deal with a few subjects chosen from it in as complete a form as possible: in fact, some of the chapters are transferred *en bloc*. Curiously enough, it includes at the end a set of examples which are not included in the larger book. A. L. B.

ENVIRONMENTAL CONDITIONS AND PHYSICAL CHARACTERS

Migration and Environment

A Study of the Physical Characteristics of the Japanese Immigrants to Hawaii and the Effects of Environment on their Descendants. By Prof. H. L. Shapiro, with the field assistance of Frederick S. Hulse. (Issued under the auspices of the University of Hawaii.) Pp. xi + 594. (London, New York and Toronto: Oxford University Press, 1939.) 32*s.* 6*d.* net.

EVER since 1912, when Boas published his studies upon the changes in bodily form of descendants of immigrants to the United States, speculations concerning the power of environmental conditions to affect the physical characters of man have been rife. At times these speculations have had but slender foundation in ascertained facts derived from proper anthropological investigation, and we have become accustomed to somewhat random statements concerning the differences in appearance between the migrants in their new environment and the parental stock in their homeland. It is obvious that the investigation of this problem is surrounded by pitfalls, and that no mere generalizations are of the least value in attempting its solution. Even when the problem is investigated by the standardized methods of anthropometry, there are still abundant sources of error that are difficult to eliminate but which will naturally invalidate the ultimate findings. It has been the first task of the reviewer to attempt the detection of any possible sources of error in the work under notice, and he freely owns that here he has failed.

The problem that Dr. Shapiro and his co-workers set for themselves was a threefold one. In the first place, they conducted an anthropometrical survey of the first generation of Japanese born in the Hawaiian Islands; in the second, of the Japanese who had come to the islands as migrants from Japan; and in the third, of the Japanese living in Japan representative of the stock from which the migrants came; this last class are termed by Dr. Shapiro 'sedentes'. We are therefore concerned with three classes: sedentes, immigrants and Hawaiian-born. It should first be made clear that all the measurements of more than three thousand individuals, whether made in Hawaii or in Japan, were recorded by the same observer. In the next place, it is important to note that the sedentes measured in Japan were inhabitants of the villages from which the immigrants were derived, and in a great many cases were actual relatives of the migrants. Of this large series of individuals there were recorded 43 measurements, 21 indexes and 41 observations.

From the enormous mass of data thus gathered together a simple and expected finding emerges, for it was found that the Hawaiian-born differed significantly from the migrant, mainly in a quantitative direction, by greater stature, increased length of limb and increased width and height of head among other things. So far, the finding seems to be the very natural one that change of total environment, often accompanied by change in social status and of occupation, has produced a quantitative change in the physical form of the Hawaiian-born Japanese. But the remarkable fact emerges that when the immigrants are in their turn compared with the sedentes, it is found that "in 18 out of 35 traits the immigrants diverged distinctively from the sedentes. In practically all the characters in which the immigrants deviate, no additional modification of noteworthy magnitude appeared among the Hawaiian-born".

Shapiro sums up this puzzling finding as follows:

"These results lead to the conclusion that in both qualitative as well as in measurable characters the immigrants display significant departures from the means and percental distributions of the sedentes. The Hawaiian-born, however, fail to show any tendency to develop further modification in their qualitative characters, although in their quantitative traits they undergo considerable modifications."

How comes it that the men and women who left Japan as adults to migrate to Hawaii differ in physical characters so notably from the kin they left behind? It would naturally be suggested that some form of selection was exercised by the emigration officers in Japan or by the plantation owners in Hawaii; but this possibility seems clearly to be ruled out. It may be suggested that migrant groups are a naturally selected strain of the parent stock, but such a hypothesis is difficult to maintain. Whatever the underlying factor may happen to be, there is no doubt that this exhaustive piece of work has opened up a new field—a field concerning which the reviewer is in agreement with the author when he sums up his conclusions in saying, "We are thus reduced to the position of suspended judgment".

F. WOOD JONES.

STORAGE OF TROPICAL FRUITS

By DR. C. W. WARDLAW,
IMPERIAL COLLEGE OF TROPICAL AGRICULTURE, TRINIDAD

WHEN work was begun at the Trinidad Low Temperature Research Station in 1928*, the immediate problem was to ascertain the keeping and carrying quality of the several banana varieties and hybrids which might be used as substitutes for the Gros Michel (the principal variety of commerce), then threatened by the epidemic spread of Panama disease. Within a few years, however, the very general use to which the Station could be put was recognized both by local agricultural administrations and by shipping companies operating in the Caribbean region, and by request work was in turn extended to tomatoes, limes, grapefruit, oranges, avocados, mangoes, papaws, pineapples, melongenes, cucurbits of various kinds, and to the assortment of vegetables that can be grown in the tropics. To some of these commodities a considerable amount of study has been devoted, and their general cold-storage requirements have now been ascertained with a sufficient degree of precision for practical purposes.

Success in transporting fruits and vegetables does not depend on refrigeration alone, and to a large extent it has fallen to those engaged on storage problems in the tropics to investigate, at least in part, related biological aspects such as the physiological behaviour of different varieties, questions of harvesting maturity, optimum conditions for harvesting, pre-storage and disinfectant treatments, the effect of different methods of wrapping and packing, post-storage treatments including ripening technique, and wastage problems in general. In the following notes some account is given of results obtained in Trinidad and of the varied botanical problems encountered in investigating the storage requirements of tropical fruits.

If not held at suitably low temperatures, the ripening of tropical fruits and the onset of wastage take place very rapidly. The practical problem, accordingly, is primarily one of arresting or retarding ripening without injuring the fruit. To do this satisfactorily, it is essential that rapid cooling to the required storage temperature should be undertaken as soon after harvesting as possible.

If an arbitrary and incomplete distinction may be drawn between 'cool' storage and 'cold' storage, it will be found that the greater number of tropical fruits require to be carried in 'cool' storage (for example, avocados, 45° F.; mangoes and tomatoes, 47·5° F.; grapefruit, oranges and limes, 45° to 50° F.; Gros Michel bananas, 53° F.; Congo and Lacatan bananas, 56° to 58° F.; papaws, 60° F., etc.), if chilling injuries are to be avoided. In that exposure to too low a temperature may result in physiological injuries such as superficial blemishing, failure to ripen, and loss of resistance to fungal pathogens already present in the tissues as latent or dormant infections, it will be apparent that the temperatures selected for the storage and transport of tropical fruits should allow of a sufficient margin of safety to avoid the danger of chilling. Indeed of recent years there has been a growing tendency to raise the storage temperatures recommended, this having been especially marked in the case of grapefruit, where 'pitting' (chill blemishing) has in the past constituted a large proportion of the wastage; thus whereas formerly temperatures below 40° F. were generally employed, the present tendency is to store fruit at 45° to 50° F., and even higher temperatures have been advocated.

Both in respect of the normal physiology of the fruit and the biology of its pathogens, the maintenance of correct humidity relationships within storage rooms or holds is of very considerable importance. This conclusion is drawn from a number of instances in which the questions of humidity and water-relations have presented themselves for consideration; it must be admitted, however, that no final statement of the exact conditions required in different instances can yet be made. But, in general, it may be said of relative humidity (*a*) that it should not be so low as to allow of serious loss in weight or modify the appearance and maturation of the fruit during the storage period; (*b*) that it should not be so high as to promote the superficial growth of fungal hyphæ; and (*c*) that localized condensation within the cargo stack must be avoided. The question of the need for improved humidity control is now being urged on all sides by biologists; in its physical and manipulative aspects it is also being closely studied by physicists and engineers, and there seems little doubt that the future will be marked by interesting and valuable innovations.

BANANAS

During the past decade, the major aspect of banana investigations has centred around the search for a variety to replace the Gros Michel or Jamaica banana. This variety, which suffers from the

* Funds were provided by the former Empire Marketing Board.

disadvantage of being highly susceptible to Panama disease, is in all other respects almost uniquely suited to the conditions of bulk stowage and transport required in the extensive Caribbean industry; symmetry of bunch, disposition and size of fingers, uniformity of growth, toughness of skin, resistance to disease and ability to be carried at a temperature sufficiently low to effect a substantial control of fungal wastage, combine to make it not easily replaceable by other varieties. Investigations on the keeping quality of possible substitutes have chiefly served to accentuate the collective advantages possessed by the Gros Michel and the difficulties of obtaining a comparable assemblage in an immune variety. A note of optimism may be sounded regarding certain hybrids which have been obtained in Trinidad by crossing a wild, seeded variety (*Musa acuminata*) with the Gros Michel. These combine resistance to Panama disease and to Cercospora leaf disease with a very considerable assemblage of the desirable qualities of the Gros Michel. The first hybrid obtained, known as *I.C.*1, is open to criticism because it yields occasional seeds. The second, known as *I.C.*2, is seedless; it possesses many of the desirable Gros Michel characters and has good texture and flavour, but the individual fruits tend to be rather short.

Several interesting results have accrued from recent bulk storage trials. When the *I.C.*2 banana is grown under favourable conditions, it is capable of yielding good bunches, as judged by the appearance, symmetry and weight of individual fingers, 9-, 8- and 7-hand bunches, suitable for export, being represented among the collection of fruit obtained from different parts of Trinidad. While the symmetry of the bunch as a whole and the disposition and shape of individual fingers are admittedly not so good as in the Gros Michel, nevertheless the hybrid *I.C.*2 possesses qualities which would make it commercially important in the event of any major failure of the Gros Michel. Its present value as a source of food among the local peasantry should not be overlooked. In relation to current storage and ripening procedure for bananas, the optimum harvesting maturity lies between '$\frac{3}{4}$-full' and 'heavy $\frac{3}{4}$-full', using Gros Michel standards of grading. 'Thin' grade fruit is difficult to ripen; 'heavy $\frac{3}{4}$-full' fruit, which behaves well during cold storage at 53° F., ripens with an excessive odour of pear drops. The Gros Michel transport temperature of 53° F., with rapid cooling to that temperature, is well suited to this hybrid.

It is generally agreed that the ideal hybrid banana of the future is likely to be one derived from the Gros Michel as female parent. Whether or not the *I.C.*2 eventually becomes acceptable as a commercial banana, any data which can be collected on its growth in the field and physiology in storage will contribute materially towards the central object of this work, that is, the maintenance of supplies of fruit of good quality.

During recent years the epidemic spread of Cercospora leaf disease in the Caribbean region has necessitated a renewal of storage trials with the Gros Michel banana. As a result of this disease many bunches undergo premature ripening while they are still attached to the plant. In storage trials it has been ascertained that the behaviour of fruit obtained from plantations which have been more or less severely infected by *Cercospora musæ* is abnormal in several respects; the pulp is of a slight to well-marked buff or pale ochraceous-salmon colour, fruit tends to ripen prematurely, to chill during the period of refrigerated transport, and to ripen with undesirable rapidity when removed to a higher temperature. Moreover, as a result of the extensive leaf destruction caused by *C. musæ*, bunches tend to grow slowly and to remain of small size; hence fruit may actually be considerably more mature than is indicated by its appearance, and departures from the normal storage behaviour for that grade may be anticipated.

Limes

The storage of limes exemplifies in particular the importance of the humidity factor. In general, limes are more difficult to handle than lemons, being less cold resistant and, because of their small size, more subject to wastage through shrivelling; the avoidance of desiccation, indeed, is one of the major problems in handling this fruit, a loss in weight of 12–14 per cent being accompanied by severe shrivelling. As loss in weight under tropical conditions may amount to 1·5–2·0 per cent per day, the commercial storage life, as limited by the onset of shrivelling, may be seriously curtailed by undue delay whilst fruit is waiting to be graded and packed. Speedy handling, protecting of fruits by suitable wrappers, and rapid cooling to 45° F. are essential to the successful storage of this commodity.

The susceptibility of the West Indian lime to wither-tip disease has necessitated the breeding of new varieties. By crossing the Philippine lime with the West Indian variety a number of hybrids highly resistant to wither-tip have been obtained. One of these, known as the *T.*1 lime, is a fruit of good appearance, juice and oil-content and is now being cultivated and marketed on a not inconsiderable scale. A second hybrid, *T.*6, possesses less favourable commercial qualities, but has proved of interest when studied with the *T.*1 hybrid and the parental types. Under identical

storage conditions, all four exhibit considerable differences in respect of loss in weight; weight for weight and grade for grade, the two hybrids are subject to more rapid desiccation than either of the parents. With regard to cold-resistance, the Philippine lime proved most resistant and the hybrid *T*.6 least; the hybrid *T*.1, on the other hand, is apparently more cold-resistant than the West Indian lime. Such variations are interesting in that they afford an indication of the rearrangement of physiological characters which may result from hybridization.

As with other kinds of citrus fruits, limes are very subject to the superficial blemishing known as oleocellosis which results from mechanical injury to turgid fruits. To avoid oleocellosis, fruits should not be picked too early in the morning or too soon after the fruits have been covered with dew or rain water.

GRAPEFRUITS

Because of the rapidly increasing importance of grapefruit as an orchard crop in the West Indies, an extensive programme of investigations has been carried out. Although data were available from experiments conducted in the United States, South Africa, and elsewhere, it was imperative, because of the relation between environment and keeping quality, to study Trinidad fruit entirely on its merits. In particular, attention has been directed to ascertaining the effect of time of harvesting, duration of the quailing or curing period prior to handling, the precise temperatures suitable for short or more prolonged periods in storage, the nature and incidence of chilling, the avoidance of excessive desiccation and the incidence and control of wastage. The behaviour of fruit derived from trees which has suffered from gummosis and root-rot also presented special problems of both practical and academic interest. Various commercial practices, for example, ethylene colouring, borax treatment, etc., which in some countries have now become standardized, when applied to Trinidad grapefruit have yielded results other than those expected. Thus when fruit is treated with borax solution before crating, as a means of controlling blue and green moulds—which, as a fact, are of minor importance in Trinidad—the effect of the fungicide is to promote the activities of the fungus *Colletotrichum glœosporiodes*, which is already present within the tissues as latent infections, so that severe wastage may result. A similar effect is produced by the use of iodized wraps. Striking variations in the keeping quality, susceptibility to chilling and to fungal disease in fruit from different localities in Trinidad have also become apparent in studies conducted over a number of years.

AVOCADOS

The avocado, which is native to Central America, is represented in the West Indies by a very considerable range of types. The majority of trees are of seedling origin and so far only a few have been selected, named and used in the propagation of standard types. The influence of environment and genetical constitution on physiological behaviour during storage is well shown by the avocado, such information as was available from investigations undertaken in America being inapplicable to fruit grown under Trinidad conditions.

Cultivated avocados are generally referred to three horticultural races, the Mexican, the Guatemalan and the West Indian, useful types being fixed and propagated by budding and grafting. Seedling avocados of the third group as grown under West Indian conditions are characterized by a low fat content, great variation in all fruiting characters, and by their comparative intolerance of cold-storage conditions (most varieties show chilling injury when held at temperatures below 50° F. (10° C.)). A distinctive feature of the avocado is its high fat content. It has been ascertained that fruit grown in Trinidad, and presumably elsewhere under moist tropical conditions, has a considerably lower oil content than that produced in Florida and California. In Trinidad, this low oil content, which is apparently largely determined by environmental factors, is characteristic of introduced as well as of local varieties.

Experimental observations indicate that the striking variability in fruiting characters of West Indian avocados is closely paralleled by the range in behaviour exhibited by fruits when subjected to refrigerated or gas storage or to a combination of both. In the avocado, maturation slowly continues even at relatively low temperatures, so that fruits ultimately become ripe. In varieties not sufficiently cold resistant, the metabolic trend is, however, abnormal, and chill effects in due course become apparent in a darkening of the vascular strands and storage parenchyma, the initiation of such changes being closely associated with the onset of ripening. As only a small number of varieties combine the requisite commercial qualities with adequate cold resistance, the practical problem is essentially one of selection.

MANGOES

In investigating the storage of mangoes, it has been necessary not only to select from the very considerable number of named and seedling varieties available for study, but also to consider such diverse aspects as criteria of harvesting maturity in the several varieties, and the effect of

season and environment on keeping quality and liability to wastage. A finding of interest to horticulturists is the very marked effect that environment may exercise on the productivity and keeping quality of different varieties. Thus, whereas the Julie variety crops well and gives a fairly good storage life when grown under the moist conditions that prevail in Trinidad, the Peter's variety is of uncertain productivity and is very susceptible to fungal rotting; on the other hand, the Peter's (Pairi or Bombay) variety, as grown under the dry conditions found in certain areas in Jamaica, yields export fruit of excellent quality.

Like many other tropical fruits, mangoes are readily subject to low-temperature injury. Chilling may be manifested in several ways, including the production of definite skin blemishes, failure to develop normal colour on ripening, failure to ripen on removal from cold storage, and a notable decline in resistance to the inroads of pathogens. Susceptibility to chilling varies with variety, maturity at harvesting and season. Trinidad experience indicates that mango varieties in general are subject to chilling injury if exposed to temperatures below 48°–50° F., superficial blemishing being accentuated by partial desiccation.

The wastage problem in mango storage is serious. Apart from damage due to wound parasites (which is inconsiderable in carefully-handled fruit) the majority of fruits, though apparently free from disease, nevertheless carry latent infections of several important pathogens. Wastage attributable to such latent infections is greatly accentuated by chilling, slow ripening and tardy distribution of ripe fruit. The high incidence of field infections directs attention to the need for careful consideration of orchard sanitation, and it is evident that questions of spacing, pruning, spraying and upkeep generally should be made subjects of special study.

Papaws

The papaw (*Carica papaya*) may be cited as an example of a tropical crop where little progress can be made in the matter of commercial cold storage until standardized supplies of fruit are made available as a result of horticultural research. The papaw is well known as the source of the digestive substance papain, obtained by coagulating the latex exuded from green fruits on wounding. During recent years some attention has been paid to this fruit as a possible export crop notably in South Africa and the West Indies. An attempt has also been made to extend papaw cultivation in California and to breed varieties adapted to prolonged storage or transport. From the information available on the production and cold-storage behaviour of this fruit, it may be predicted that the organization and standardization of an export industry will be attended with serious difficulties.

The papaw shows great variety in its fruiting characters, some types producing small spherical fruits no larger than an orange, while others have elongated fruits as large as a watermelon and weighing up to 25 lb. In working towards an export trade, standardized production is a first essential; the basic problem is, therefore, to select and perpetuate good types from material which is notoriously variable. Again, as most varieties are dicœcious, the liability to a low standard of production is accentuated by the number of male plants present in a sowing.

Storage trials carried out in Trinidad have shown that relatively immature papaws will not ripen after cold storage, and further, that most of the varieties tested show evidence of chilling if held at temperatures lower than 55°–60° F.

Tomatoes

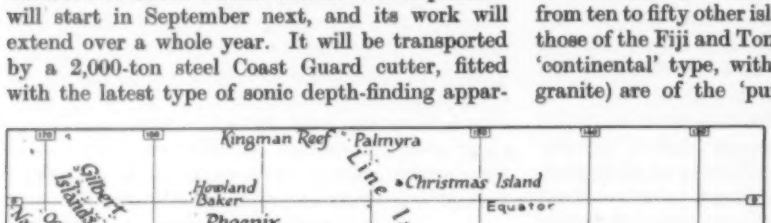
Tropically-grown tomatoes may be mentioned as illustrating the unexpected in storage investigations. Thus it has been ascertained that fruits of several varieties grown under Trinidad conditions have yielded storage records which compare very favourably with those obtained elsewhere. When picked full-grown but green, Trinidad fruit can be kept in cold storage at 40°–47° F. for twenty to thirty days, and on removal to a higher temperature remains in good condition for a further eight to ten days. These results have been confirmed over a number of years and are in marked contrast to the rapid degeneration recorded in comparable storage trials with fruit grown outside the tropics. In view of the disparity between Trinidad findings and previous English results, storage trials were undertaken at the Low Temperature Research Station, Cambridge, in which supplies of glass-house fruit grown during summer and autumn respectively were used; the summer fruit gave results comparable to those obtained in Trinidad; the autumn fruit, on the other hand, was characterized by the poorer keeping quality already mentioned. As to why summer-grown fruit or that obtained under tropical conditions should be more tolerant of low temperatures is not understood.

During recent years the terms of the grant from the Colonial Development Fund by which this Station is maintained include a concentration on fundamental research with special reference to the banana.

UNITED STATES GEOPHYSICAL EXPEDITION TO THE PACIFIC OCEAN

BY PROF. S. CHAPMAN, F.R.S.

A NOTABLE expedition has been arranged by the National Geographic Society of America and the University of Virginia, with the co-operation of the United States Coast Guard, to undertake varied geophysical investigations in the Central and South Pacific Ocean. The expedition will start in September next, and its work will extend over a whole year. It will be transported by a 2,000-ton steel Coast Guard cutter, fitted with the latest type of sonic depth-finding apparatus, and carrying a two-seater scout observation seaplane which will be used in making aerial photographs and island maps. While the scientific work is proceeding, the Coast Guard will make a survey of present and future needs for navigational and radio aids to marine and air commerce.



The expedition will range over an area of 4½ million square miles, south of the Hawaiian Islands, east of Australia and New Guinea and north-east of New Zealand; most of its work will be done on the many islands scattered over this area. These islands are all owned or controlled by the United States of America, France, and Great Britain or the British Dominions; westernmost of those to be studied is Nauru, practically on the equator, about 800 miles north-east of Australia. Easternmost is Ducie Island, nearly in the longitude of San Francisco, almost on the tropic of Capricorn. The northern and southern limits of the area studied will be Kingman Reef (500 miles south of Honolulu) and Pitcairn Island. The expedition will sail from San Francisco, first visiting Canton Island, now under joint American and British control. During its twelve months in the field, the ship will put in at intervals at Honolulu and Auckland, New Zealand, for supplies and mail. From time to time the expedition will send out radio broadcasts describing its progress.

The expedition will set up major bases on twenty or more islands, and from each major base will visit from ten to fifty other islands. All the islands except those of the Fiji and Tonga groups (which are of the 'continental' type, with a foundation of very old granite) are of the 'pure Pacific' type, either of recent volcanic origin, or of coral resting on recent underwater volcanic outpourings.

Gravity determinations and magnetic observations, together with careful observations of latitude and longitude, will be made on the islands visited, and at the same time the geology of the islands will be studied: the region is virgin ground for the gravity survey, and of course magnetic observations everywhere need to be repeated every decade or so in order to keep up to date our knowledge of the earth's changing field. Artificial seismic waves will be set up by explosions on the ocean bed to indicate the types and depths of rock below; mud 'cores' will also be obtained, showing the composition, for a depth of several feet, of the top layer of the ocean floor. Observations on marine biology will be made, and radio engineers will accompany the expedition in order to investigate radio phenomena.

The expedition is thus one of the most important and extensive scientific exploration surveys undertaken by any country for many years: in several respects its programme coincides with that which was recently arranged, for work over a much more limited area (on or near the edge of the continental shelf off the British coasts), by the Royal Society with the co-operation of H.M. Navy—though the completion of that survey was prevented by the political crisis of last September. It is greatly to be hoped that the plans for the proposed United States expedition may be carried through fully and successfully.

OBITUARIES

Mr. H. Havelock Ellis

BY the death on July 8 of Henry Havelock Ellis, both science and literature have sustained a heavy loss. Havelock Ellis was born at Croydon eighty years ago. At sixteen years of age, owing to ill-health, he was sent to Australia, and later became an assistant schoolmaster in a suburb of Sydney. During a lonely adolescence he was greatly troubled by moral and spiritual difficulties, and decided to devote his life to systematic inquiries that should make clear to himself and to others the real nature of the problems of sex. With this in view he returned to London, and trained as a general practitioner at St. Thomas's Hospital.

After a few months in general practice, literary and scientific activities began to absorb all Havelock Ellis's time. He became editor of the "Contemporary Scientific Series" and co-editor of the "Mermaid Series" of old dramatists; and was soon widely known as a critic and essayist, and later as a popular philosopher and an interpreter of the national genius of France and Spain. His books on "The World of Dreams", "Man and Woman", "The Criminal", "A Study of British Genius", revealed his strong psychological interests and his gift for impartially collecting scientific observations and expounding scientific facts in a lucid and impartial way.

In a long list of publications, the most important work written by Havelock Ellis was that entitled "Studies in the Psychology of Sex". There is no need to repeat the oft-told story of the prosecution of its publisher, and the founding of a defence committee which included George Moore, William Sharp and Bernard Shaw. In spite of judicial condemnation, the volumes might have been seen on the shelves of most British psychologists at the beginning of this century; and his influence undoubtedly paved the way for the sympathetic interest aroused by Freud's more startling doctrines later on. Freud himself, indeed, has more than once acknowledged the value of Havelock Ellis's pioneer work.

Unlike Freud, Ellis was more interested in collecting data than in constructing theories. The results of psychological tests were duly reported in his pages whenever they were obtainable; but since experimental work was only in its infancy when he wrote, his books will remain a collection of suggestive observations rather than of experimentally verified facts. His views on crime, on genius, on the mental differences between the sexes, though still freely quoted, can no longer be regarded as representing the results of the latest researches. Nevertheless, his lucid and delightful style, and the charm of personality that shines through it, will keep his psychological writings alive and influential when the publications of the academic psychologists of his day lie dead and forgotten.

Dr. Henry Correvon

THOUGH better known as a horticulturist than as a botanist, Henry Correvon made considerable contributions by his numerous publications to botanical science. His death in his eighty-fifth year on May 11 leaves a notable gap among the devotees of alpine plants, whom he has done so much to encourage and assist by his own enthusiastic labours.

Born at Iverdon in 1854, Correvon was educated in this little Swiss town, and, losing his father at an early age, was sent to learn horticultural practice first to Geneva, then to Zurich, Frankfort, Erfurt and finally to the Jardin des Plantes in Paris, where he received botanical as well as horticultural training. Thus well equipped, he returned to Iverdon to take charge of the horticultural establishment founded by his grandfather, which had suffered greatly from the neglect of the tenant who had carried on the undertaking. Capable and energetic, Correvon commenced to work up this family heritage, but, alas, only to see most of his improvements totally destroyed by a devastating cyclone in July 1877. The low-growing alpine plants alone survived the ravages of the storm. He transferred his energies to Geneva, where he established a nursery for alpine plants, in the cultivation of which he was so successful that he ultimately purchased in 1902 a large vineyard at Chêne-Bourg high above Geneva. Here he created the wonderful garden "La Floraire" known to all cultivators of alpine gardens. To it he had transported limestone rocks from the Salève and the Jura and granite blocks from the Alps so as to have suitable surroundings for his pet plants.

Correvon's interest in these was not limited to those in his own garden. He was one of the originators of "La Linnea", the alpine garden at Bourg St. Pierre, now under the management of the University of Geneva. He was also concerned in the management of the alpine garden on the Rochers de Naye above Montreux and for a time with that above Saint-Cergue. His love for these, and other efforts for the preservation of the mountain plants, made him a prime mover in the formation of the Swiss Nature Protection Society.

Alphonse de Candolle persuaded Correvon to learn English, and for some years he acted as a correspondent of the *Garden*. In 1886 he visited England and wrote enthusiastically about some of the gardens he saw, and spoke with admiration particularly of the cultivation of the terrestrial orchids by various British horticulturists. This group of plants was particularly dear to him and led to his publication of a little book in 1893 on "Les Orchidées rustiques", followed in 1899 by his "Album des Orchidées", of which a second edition has appeared. His publications were, however, not limited to orchids. They included books on trees, ferns, flowers

of fields and forests, water and marsh plants. His book on "Rock Garden and Alpine Plants", translated from the French edition, was published in New York. His "Alpine Flora", with its wonderfully artistic representations of the plants described, appeared in an English translation in London.

Correvon was an indefatigable worker and an excellent lecturer. Ten years ago, at the age of seventy-three years, he undertook a visit to the United States, where he gave some forty lectures and addresses in English to promote the interest in alpine gardens. He was an honorary member and correspondent of many horticultural societies and was awarded an honorary doctorate of the University of Geneva in 1931.

He retained his full powers of body and mind until the end, and his beloved garden at Chêne-Bourg is assured of its continuity in the hands of his son and his grandson, both trained gardeners and possessing Henry Correvon's devotion to alpine plants.

Sir Frederick Hobday, C.M.G.

THE veterinary profession has lost a pioneer of ability with the passing of Sir Frederick Thomas George Hobday at the age of sixty-nine years on June 24.

Hobday graduated at the Royal Veterinary College in 1892. His early contributions to veterinary science were on the applied side. He was responsible for the more general use of anæsthesia in veterinary surgery, and decreased the hazard of volatile narcosis by means of inhalers, which he designed to control the depth of anæsthesia. In addition he developed methods of abdominal surgery in large animals, and successfully applied the Williams technique for the relief of roaring in horses.

Sir Frederick's real scientific achievements cannot be judged by his publications, but rather by his active and successful efforts in creating research facilities at the Royal Veterinary College, and in bringing the medical and veterinary branches of medicine into more intimate contact by the formation of the Section of Comparative Medicine in the Royal Society of Medicine. He was the first veterinary president of this section (1924–26).

In 1927, Sir Frederick was made principal of the Royal Veterinary College. He took over a college the buildings of which were in danger of collapse and the financial position of which could not have been worse. His enthusiasm enabled him to raise by voluntary subscription the sum of £135,000. This, together with a Treasury grant of £150,000, made it possible for him to realize his ambition of rebuilding the College. The new main block, housing the long-needed research and teaching facilities, was formally opened in 1937 by the King and Queen.

This ten years of strenuous endeavour drained Hobday's strength, and the unexpected termination of his principalship in 1936 came as a heavy blow both to him and to his many friends, though formal resignation was delayed until the opening ceremony. His efforts, however, had received recognition by the conferment of knighthood in 1933. He was honorary Veterinary Surgeon to Queen Alexandra, King George V, King Edward VIII and King George VI.

The Royal Veterinary College in London stands as a monument which will always be associated with his name, and those working there will be reminded that it was due to his unremitting energy that such excellent facilities are available.

J. YULE BOGUE.

Dr. W. H. Neale

DR. WILLIAM HENRY NEALE died on June 15 in his eighty-third year. He was born in Batavia, where his father, Dr. Richard Neale, was then in practice. He came to England as a boy and attended a private school at Hampstead. He studied medicine at King's College and University College, London, and took the degree of M.B. in 1879, proceeding to M.D. in 1883.

In 1880 Dr. Neale joined Mr. B. Leigh Smith as surgeon and naturalist on a sporting and exploring voyage in the steam yacht *Eira* to the then almost unknown coast of Franz Josef Land, where discoveries of considerable geographical importance were made. In 1881 Dr. Neale returned with Mr. Leigh Smith in the *Eira* on a more ambitious summer expedition to the same region, where the yacht was caught in the ice-floes and sunk close to Cape Flora.

The disaster was so sudden that very little could be saved from the wreck and the only hope of rescue was in the power of the ship's company to help themselves. A hut large enough to house the twenty-five men was built and Mr. Leigh Smith's skill as a hunter secured an adequate supply of walrus and bear meat. Dr. Neale had charge of the rationing of the food so as to preserve the health of the men, such tinned provisions as had been saved being kept for the homeward boat voyage. He was troubled by the prospect of an outbreak of scurvy in the absence of lime-juice, in which the British sailor had learned to trust as the only preventive. He found, however, that the fresh meat diet was in fact the best possible antiscorbutic, and on his return he dealt with the etiology of scurvy in several communications to the medical press, and he must be viewed as one of the first to recognize the value of fresh meat as a preventive.

The winter of 1881–82 was passed safely though the temperature sank to − 40°. When the ice began to break up at the end of June a start was made to the south in four small open boats. There were hardships in plenty and a baffling journey of more than 500 miles to be made through the shifting leads of the icefloes and in the open sea. After six weeks, the relief ship *Hope* was met on the coast of Novaya Zemlya, and the whole party were still in sound health in spite of the trying experience.

Dr. Neale studied the natural history of the Cape Flora region and described his collections in the *Proceedings* of the Zoological Society. He became a valued fellow of the Royal Geographical Society and frequently spoke after polar papers.

For more than half a century, Dr. Neale lived as a general practitioner in the St. John's Wood district, endearing himself to an increasing circle of friends by his skill, devotion to duty and trust-begetting kindness. HUGH ROBERT MILL.

WE regret to announce the following deaths:

Prof. H. H. Barnum, head of the Department of Mathematics in Robert College, Istanbul, aged sixty-one years.

Dr. W. A. Potts, a pioneer in the psychology of crime, on July 23, aged seventy-three years.

Prof. E. R. A. Seligman, McVickar professor of political economy and finance in Columbia University during 1904–31 and editor of the "Encyclopædia of Social Sciences", aged seventy-eight years.

Mr. J. M. Wood, formerly engineer of the New River Company and of the northern district of the Metropolitan Water Board, on July 21, aged eighty years.

Prof. Archibald Young, regius professor of surgery in the University of Glasgow, on July 23, aged sixty-five years.

NEWS AND VIEWS

Dr. Wilson Smith

DR. WILSON SMITH, who has just been appointed to the chair of bacteriology in the University of Sheffield, graduated in medicine at the University of Manchester in 1923, after War service in France and Belgium with a field ambulance during 1916–19. He obtained the diploma in bacteriology at Manchester in 1927 and was granted the M.D. degree in 1929. For the last ten years he has been a member of the scientific staff of the Medical Research Council and during this period he has made many valuable contributions to knowledge on bacteriological problems —such as the standardization and assay of pneumococcus antisera—and also on various virus diseases. Perhaps the most important of these latter contributions are the facts regarding the virus of epidemic influenza. As a member of a team, he was one of the discoverers of this virus and he helped to lay down criteria for its recognition; he did much of the pioneer work which has led to a renewed and intensive investigation of influenza throughout the world. Since 1934 he has been one of the editors of the *British Journal of Experimental Pathology*.

Mr. Hugh Main

THE council of the British Empire Naturalists' Association has elected Mr. Hugh Main as new national president in succession to Mr. Douglas English, who recently retired owing to ill-health. The presidency of the Association is not an annual affair and the choice of Mr. Hugh Main will meet with wide acclamation, for he is well known for his interest in nature photography and his insect studies. He spends much time in his private photographic studio at Woodford Wells in Essex, or in collecting insect specimens. He has long been a vice-president of the Association, and when the new Epping Forest Branch of the Association was formed, Mr. Main was elected its first president. He has made conspicuous contributions to nature photography and he has also been an active man in the field as well as on the lecture platform. He has also made some noteworthy experiments with his insectarium. Mr. Main has long been a keen and enthusiastic worker for the Association and has done much in various ways to promote its welfare. He is the Association's referee for beetles. The British Empire Naturalists Association now has twenty-four local branches each with separate meetings and officers, and thirty-five other natural history societies are affiliated to it.

Public Health and the Supply of Medicaments

THE address of Mr. J. Rutherford Hill, as chairman of the Pharmaceutical Conference, which met at Birmingham on July 17–21, was entitled "Public Health in relation to the Recognition, Definition, Standardisation and Controlled Supply of Medicaments", and he makes recommendations under all these heads. Lists of recognized drugs are supplied by the national pharmacopœias of many countries; it is hoped that these will eventually be replaced by an international pharmacopœia, but this would not solve the whole problem. Medicine is advancing rapidly and pharmacopœias soon get out of date. Some authority in Great Britain should publish a list, like the American list of New and Non-Official Remedies, which would be kept constantly up to date. The British Medical Association and the Pharmaceutical Society of Great Britain have recently been forced by considerations of cost to abandon the proposal to publish such a list jointly. The Government should undertake this important public service. Proper regulations for the definition of medicines would make it impossible for the manufacturers to confuse the public, and fill up the shelves in pharmacies, by selling the same simple chemical substance under a dozen synonyms. Mr. Hill also recommends that the present arrangements for the standardization of medicines should be extended, and that their retail sale should be confined to pharmacists. This would not mean a monopoly for one class of the community, but only that those firms which sell medicines should be compelled to employ salesmen who have been properly trained.

Marking of Patent Medicines

WHEN the question of withdrawing Medicine Stamp Duties was debated recently in the House of Commons, it was clear that there was a general feeling that proprietary medicines should not be freed from all restrictions, but should be subjected to effective control. Some of them are fraudulent, their advertisements encourage healthy people to think they are ill, and unhealthy people to postpone taking medical advice until it is too late, and some of them are poisons. The recent passing of effective legislation in the United States was largely due to the fact that seventy-three people were killed by an elixir containing diethylene glycol, just at the time when the matter was being debated in Congress. It would be unfortunate if another such accident were to occur in Great Britain before effective measures were introduced. Reforms of various kinds are being widely discussed. Prof. A. J. Clark, in a little tract published last year under the title "Patent Medicines" said: "The clearest line for the Government to take would be to say that it did not wish to tax any remedy that was beneficial to the health of the people, and wished to suppress all those that were useless and harmful." This would imply regulations such as those now enacted in the United States, where new remedies can only be sold when they have been officially approved. Lord Horder, in his speech in the House of Lords, stressed the harm that is done by misleading advertisements and recommended that measures for the control of quack medicines should form part of the campaign for national fitness.

Organization for War Emergency

EXTENSIVE preparations are in progress to meet a possible war emergency, not only in regard to defence, but also in other directions. On the medical side, the Ministry of Health has issued a "Statement Relating to the Emergency Hospital Organisation, First Aid Posts and Ambulances" (London: H.M. Stationery Office. 4*d*. net). This sets out, in the first place, emergency hospital requirements and organization, schemes for dealing with casualties and ambulance services. A summary is then given of supplies that are being provided. These include 200,000 beds with mattresses, 320,000 blankets, with a corresponding sufficiency of sheets, pillows, pillowslips and towels, and 226,000 stretchers with 400,000 coloured blankets. In addition, drugs and dressings to the value of £237,000 are on order, as well as surgical equipment and appliances sufficient for 75,000 casualty beds. On the food side, the Government has advised all who can to lay in a week's store of emergency food. In order to translate the Government's advice into practical terms, the British Medical Association has issued a booklet, which should be in the hands of every householder ("How to Stock your A.R.P. Larder". 2*d*.). This gives advice on the stores that should be purchased in order to provide a week's food supply for a family of five. The approximate cost of the articles suggested is given, together with hints for storage and use, a few sample recipes for one dinner, and the food values of the rations mentioned.

Nutrition and the Public Health

THE proceedings of one of the most useful conferences of recent years—the National Conference on the Wider Aspects of Nutrition organized by the British Medical Association and held in London at the end of April—have recently been published under the title "Nutrition and the Public Health" (B.M.A. House, W.C.1. Pp. 150. 2*s*. 6*d*. post paid). This conference, a report of which appeared in NATURE of May 6, p. 745, brought together representatives of medicine, agriculture, industry, administration and education to discuss in a comprehensive way the relation of human nutrition to the national welfare. It urged upon the Government the formulation of a long-term food policy in which the requirements of health, agriculture and industry should be considered in mutual relation, and recommended the inauguration of an educational campaign to make such a policy effective. The Conference ranged over a wide field, but as the published proceedings clearly indicate, there was the thread of the urgent need for an active, informed Government policy, which should take as its main objective the abolition of malnutrition, running through every discussion. The common benefit to the health of the individual citizen, to the prosperity of the home farmer (who would be largely responsible for the perishable 'protective' foods so essential to such a scheme) and to the efficiency of industry of such a policy forms the triple basis of what is undoubtedly one of the clearest and most influential appeals yet made for the early application of modern nutritional knowledge to national well-being.

Teachers on Modern Education

THE addresses delivered at sectional meetings arranged in connexion with the recent annual conference at Llandudno of the National Union of Teachers (Hamilton House, Mabledon Place, London, W.C.1) have been issued as a bound pamphlet. They include one by Mr. Kenneth M. Lindsay on the development of our educational system, in which he suggests that a commission is required on the whole financial relation between central and local government if the implications of the Spens Report are to be carried out. He also stresses the need for developing technical education, including the provision of improved premises and closer co-operation between technical education and industry and commerce. Emphasizing the importance of adult education, he pointed out the need for an effective survey of this field. Dr. C. F. Strong's address on the teaching of citizenship in central schools refers to the importance of including the civic aspects of science in a science syllabus, and urges the importance of history as laying the foundation for the teaching of citizenship and dispassionate thinking about political questions. Mr. E. R. J. Hussey's paper on aspects of education considered as a preparation for life in the modern world also emphasizes the importance of science, especially biology, from this point of view as well as the importance of character training and the formulation of ideals and a sense of values. Dr. G. H.

Green's address on the cinema and handicraft training directs attention to the need for investigation in the technique of using the film in schools.

The Hebrew University, Jerusalem

THE Hebrew University, on the heights of Scopus in Jerusalem, is developing fast and well. Begun in 1923 with a Chemistry Research Institute, it is to-day a centre of research and instruction, with faculties in the main branches of learning, an academic staff, including research workers, of 125, and a students roll, under- and post-graduate, of 850. More than 30 per cent are women. Hebrew is the language of instruction. In some Departments are men pre-eminent in their own academic field. Prof. Bernhard Zondek, professor of gynæcology, is in charge of the Hormone Research Laboratory which is now attached to the new Medical Centre opened in May of this year. Prof. S. Adler, head of the Microbiology Department, has already achieved an international reputation for his pioneer work on tropical diseases transmitted by parasites, and has undertaken several expeditions on behalf of the Royal Society. Prof. A. E. Fraenkel, formerly of the Universities of Marburg and Kiel, is one of the professors in the Mathematics Department, with mathematical philosophy and foundations of theory of sets and of analysis as his special field. The Archæological Department, under Prof. L. A. Mayer, works in close association with the Department of Classics.

Two new faculties have been added this year, a medical faculty—it was formerly only a pre-faculty—and agriculture. The new professor of agriculture is Prof. E. Volcani, director of the Experimental Research Station at Rehovoth. The Hebrew University has played its part in enabling academic refugees to continue their work. Already nearly fifty exiled German scholars have been found positions at the University. These include Prof. H. Torczyner, the interpreter of the Lakhish Letters, Prof. J. Guttman, the authority on Jewish medieval philosophy, Prof. Martin Buber, the social philosopher, Prof. B. Zondek, the gynæcologist, Prof. Halberstadt, the radiologist, and the brothers Adelbert and Ladislaus Farkas, who are directing the Department of Physical Chemistry. The work already done gives promise that perhaps in the not-distant future Jerusalem will once again become the centre of learning in the Near and Middle East.

University and Professional Standards in the U.S.A.

THE formulation of standards in respect of such matters as entrance and graduation requirements, staff, equipment and financial resources, and the accrediting of educational institutions with reference to them, are undertaken in the United States by voluntary national and regional associations and by State universities and departments of education. Lists of accredited institutions are published from time to time and the situation is reviewed by the United States Office of Education once in every four years. Bulletin No. 16, "Accredited Higher Institutions, 1938" (Supt. of Documents, Washington, D.C., pp. 212; 20 cents) brings together the latest available lists and standards of both voluntary and State accrediting agencies. The most noteworthy development of the past few years is the drawing up by the Engineers' Council for Professional Development of a statement of principles (reproduced in the Bulletin) for accrediting engineering curricula with the object of improving the status of the engineering profession. Other national associations have published lists of accredited professional and technical schools of law, theology, medicine, pharmacy, osteopathy, optometry, music, architecture, business, librarianship, journalism, forestry, social work and teaching. A National League of Nursing Education is conducting a survey with the intention of issuing a list of accredited schools on its completion. Of the university accrediting agencies, the chief and most exclusive is the Association of American Universities, which regards as the principal ground for the inclusion of a college in its approved list, evidence of success "in stimulating scholarly interest in its students and in preparing them for more advanced scholarly endeavour".

The Carnegie United Kingdom Trust

TWENTY-FIVE years have elapsed since Mr. Carnegie founded, with a capital of ten million dollars, his Trust "for the improvement of the well-being of the masses of the people of Great Britain and Ireland", and the Trustees preface their report for the year 1938 with a brief retrospect, in the course of which the allocation of their revenues since the Trust's foundation is summarized under the headings: libraries £1,393,000, physical welfare and playing fields and play centres £471,300, rural development and social service (including land settlement) £541,800, organs and other musical and dramatic activities £330,500, adult education £66,600, other activities £339,500. In pursuance of Mr. Carnegie's injunction to remember "that new needs are constantly arising as the masses advance" the Trustees aim at fulfilling the role of a pioneer body, financing no enterprise for more than a limited period, during which its sponsors are expected to contrive means for maintaining it, should its continuance appear expedient, without further recourse to the Trust. This principle plays a decisive part in the framing of the programmes of constructive experimental work which are drawn up by the Trustees once in five years and which pre-determine the bulk of the expenditure of each year's budget.

THE current programme covers activities classified as: (*a*) cultural and æsthetic developments, including libraries, museums, music and drama, adult education; (*b*) social services, in many of which the National Council of Social Service collaborates, including village halls, community councils, shows and exhibitions, university settlements, village colleges, women's institutes, Zoological Society's films, national parks, youth services, etc.; and (*c*) land settlement. One of the notable events of the year was the publication of a report in furtherance of the policy inaugurated ten years ago for developing the educational function of museums of the British

Isles. The report, based on a two years survey by Mr. S. F. Markham, is accompanied by a short non-technical pamphlet, "Museums and the Public" for the use of museum committees.

Mycenean Athens

THE discovery at Athens of a chamber-tomb of Mycenean age, which presumably had served for a royal burial, corroborates tradition, but at the same time necessitates a new orientation in assessing the importance of the settlement of Attica in early pre-classical times. The chamber was brought to light in the course of the present—the ninth—season of excavation on the Acropolis by the American School of Classical Studies. In a preliminary account of the discovery (*Illustrated London News*, July 22), Prof. T. L. Shear of Princeton University, field-director of the excavation, states that the tomb is situated in shallow accumulations of deposit on the northern slope of the Acropolis. It consists of a rectangular chamber, filled with splintered rock and approached by a dromos, or passage, some 45 ft. in length, but which originally may have been longer, as the outer end is cut by the Roman wall. The earth-filling of this passage contained a number of Mycenean pot-sherds. Both passage and burial chamber had been cut from the rock; and the entrance to the chamber from the passage is through a rock-cut doorway. This doorway was closed by carefully packed stones, which clearly had not been disturbed since they were placed in position.

INSIDE the chamber on one of the rock-cut benches, which run along each side, were six vases and a cylindrical ivory box in their original position. The vases had been crushed by the collapse of the roof, but the ivory box, which is described as "a masterpiece of artistic design and of technical execution", was intact. East of the doorway were two large vases standing on the floor by a copper ladle. The grave was cut in the rock to a depth of four feet. It had been covered by a stone slab; but this had been removed, and lay diagonally by the grave. Neither bones nor offerings were found in the grave, although there was one small disk of gold in the earth and stones which filled the grave. On the floor beside the slab lay a group of small toilet articles—a bronze mirror, a small ivory box, and ivory pins; and north of the grave, also on the floor, were three piles of gold ornaments. The pottery is of a single period and is characteristically Mycenean in form and decoration. Exact parallels can be found in Mycenean pottery from the Argive Heraeum and elsewhere belonging to the third Late Helladic period of the first half of the fourteenth century B.C. The state in which the tomb was found and the character of the offerings lead Prof. Shear to the conclusion that this is the burial place of a lady, probably belonging to the royal house of Erechtheus, the legendary king of Athens, whose body was removed when the roof of the chamber collapsed; while the wealth of the offerings—overlooked when the body was removed—gives rise to a completely different conception of the kingdom of Erechtheus in the fourteenth century B.C. from that conveyed by the fragmentary remains of the walls of his palace, which have been discovered on the Acropolis, and the unimportant part played by Athens in the Trojan War five generations later as recorded in the Homeric poems.

Industry and Agriculture in Belgium

IN a pamphlet on the National Foundation for Scientific Research and Industry, the contribution of this body to industry and agriculture in Belgium during the last ten years is reviewed by P. Beghin, the secretary of the Foundation (Pp. ix+408. Bruxelles: Fonds National de la Recherche scientifique). Since the Foundation gave its first grant in July 1928, 252 persons have received grants, 75 of whom are still receiving them, while 35 fresh grants are made each year. In subsidies of all kinds, 25,000,000 francs has been distributed amongst 1,350 research workers. The annual budget of the Department of Industrial Science of the Foundation is limited to 1,000,000 francs. Taken by industries, the distribution of research effort is concentrated mainly in agriculture and horticulture (1,532,460 francs), metallurgy (1,299,000 francs), electrical engineering (1,209,400 francs), out of a total of 7,166,810 francs, chemistry coming next with 730,750 francs and civil engineering with 630,100 francs. The report includes more or less detailed accounts of work in progress in metallurgy, welding, the thermodynamics of heavy-oil motors, electrical apparatus, including incandescent electric lamps, radio reception, civil engineering, including the action of wind on buildings, chemistry, including synthetic lubricating oils, copal gum, synthetic resins for the electrical industry, vulcanization of rubber, the charcoal industry, glass industry, cement industry, optical industry, as well as in agriculture, including the disinfection of plants and the cultivation of the beetroot, the brewing industry and the tanning of leather.

British Museum (Natural History): Recent Acquisitions

AN interesting acquisition in the Department of Zoology is a series of the golden mole, *Eremitalpa granti*, presented by Captain G. C. Shortridge of the Kaffrarian Museum, King William's Town, South Africa. The gift comprises seventeen skins and skulls of this insectivore, and forms a valuable addition to the study collections. Mr. F. N. Ashcroft has presented to the Department of Mineralogy a further selection of well-crystallized minerals from forty-seven carefully recorded localities in Switzerland. The Ashcroft collection of Swiss minerals is unrivalled in the excellence of the specimens and the care with which the localities have been recorded. This latest gift brings the number of specimens added to the Museum's collection from this source in the last ten years to a total of 3,654. Another interesting gift comes from the McGregor Museum, Kimberley, through Miss M. Wilman, the curator, and consists of three specimens of the doubly refracting Iceland spar found in Cape Province, South Africa. A collection comprising about 4,900 gatherings of plants has been brought back from South America by Mr. A. H. G. Alston, assistant keeper in the

Department of Botany. Of these about 1,900 are vascular cryptogams. The collection is rich in duplicates and there are about 20,000 specimens in all. Mr. Alston represented the Museum at the first South American Botanical Assembly at Rio de Janeiro last October, and later made an expedition across the north western corner of the South American continent from La Guayra in Venezuela to Bartacoas in southern Colombia, near the frontier of Ecuador. He studied the phytogeography of the area and collected specimens of the plants found.

Anthropology and Ethnology in Switzerland

THE *Bulletin der Schweizerischen Gesellschaft für Anthropologie und Ethnologie*, 1938–39, in addition to the annual report, obituary and other affairs of domestic concern, contains matter of wider interest for anthropologists in a contribution by the editor, Dr. O. Schlaginhaufen, "Untersuchungen über die Gesichtsform der Schweizer" which was presented to the International Congress of Anthropological and Ethnological Sciences at Copenhagen in August last, and summaries of the anthropological communications to the annual meeting of the Société Helvétique des Sciences Naturelles at Coire, August 28, 1938, from the *Actes* of that Society. Among these, a group of papers by Prof. E. Pittard deals comparatively with various lesser known physical characters of the Bushman and other peoples of South Africa, upon which the author's promised further interpretations will be awaited with considerable interest.

STUDENTS of the skeletal remains of man may be directed particularly to the study by Dr. Albert L. Périer of a remarkable postmortem deformation of the mandible in six out of a collection of twelve Griqua skulls. In these six specimens, the bicondylar diameter of the mandible is by so far less than the corresponding basio-cranial diameter that it is impossible to articulate the jaw to the skull; and indeed, if it were not for the correspondence of other characters, it would be difficult to believe that their attribution to these crania is correct. In three of the skulls the discrepancy in diameter is ten millimetres or more. It is to be noted that the bone of the jaw is exceptionally thick, and the shrinkage absolutely symmetrical. No acceptable explanation of the change presents itself, especially as no other example is found in one hundred and fifty South African skulls in the collection to which the Griqua skulls belong. The author points the moral that caution must be exercised in drawing conclusions from isolated specimens in human palæontology.

Tests of Materials

NUMBERS 726 and 727 of Hermann's "Actualités scientifique et industrielle" (Paris) deal with tests of materials and are entitled "La Structure et la Déformation des Solides" and "Essais des Métaux", respectively, the former of fifty pages (18 francs), the latter of seventy pages (25 francs), both well illustrated. They are written by M. R. L'Hermite, assistant director of the Laboratory for Buildings and Public Works, Paris, and represent his lectures delivered at the Laboratory in 1937 and 1938. He emphasizes the influence of the fine structure of materials on their elastic properties and devotes half the first volume to microscopic and X-ray methods and their results. In the section on the deformations produced by applied forces he makes use of the Mohr-Caquot diagrams and theory, and ascribes deviations of experimental results from the theory to want of isotropy. In the second volume many of the newer forms of machines for testing metals under tension, compression, shear, bending and shock are described, as well as methods of testing hardness, wear and fatigue. The principal results obtained are given and are related to the Mohr theory.

Bibliography of Seismology

THIS bibliography, by E. A. Hodgson, published by the Dominion Observatory, Ottawa, for the period October–December 1938 has just been received. It contains 120 items from fourteen collaborators residing in eight countries, and it is noticeable that the United States and Holland are well represented and that Spain has a collaborator. Italy, the Balkan States, the U.S.S.R. and South America are this time not represented although it is known that seismological work is being done in all these places. One of the more recently studied branches of the subject is well illustrated by a paper by A. Belluigi ("Seismisch-electrische Wirkungen und neu-mögliche seismische Anwendungen", *Bei. Angew. Geoph.*, 7, Heft 3, 260–264, bib., Leipzig, 1938). It concerns the new seismic-electric effect pointed out by American authors, and the author suggests that its probable cause consists in electrochemical alterations produced by elastic waves as Thyssen, Hummel and Rülke have demonstrated. It is further suggested that new electro-elastic seismometers be planned, as these should afford advantages over the present seismometers in exactness of reproduction of impulses, owing to the absence of inertia masses, and they should measure at the same time the electrical resistivity. Following the bibliography is a very valuable double index for the whole year, arranged first by subjects and then by names.

Journal of the Royal Agricultural Society

THE *Journal of the Royal Agricultural Society of England* has reached its hundredth volume, and with this issue certain changes of format are being made. In place of the single annual volume, a periodical appearing three times a year is to be published. The first part, issued in June, consists mainly of the usual reviews of agricultural research under the familiar title, "The Farmer's Guide", but also includes the annual financial statement. Part 2 will appear in November and will contain a number of contributed articles and the various reports on the Show. Part 3 will be published in March and will also contain a number of contributed articles, the report of the Council to the annual general meeting, the annual reviews of agricultural law and agricultural statistics,

and the annual report of the Society's scientific officers and of its research committee. Each part will include a summary of the proceedings of the Council at its meetings in the previous two or three months and will be separately indexed. The June issue for 1939 (100, Part 1) is now available and can be obtained from the Society, 16 Bedford Square, W.C.1, price 5*s*.

The Grid System

THE Association of Engineering and Shipbuilding Draughtsmen publishes (Draughtsman Publishing Co., Ltd., 96 St. George's Square, London, S.W.1) a series of pamphlets containing much useful information. A recent issue, entitled "The Grid System", contains a historical survey of electricity supply in Great Britain from the formation of the Edison Light Co. in London in 1881, through the troublous years when various Acts of Parliament were passed which in some cases hampered the industry; the first contracts for the 'grid-iron' or grid system were placed in the year 1928, and this was followed by the growth in the space of six years of 4,000 miles of transmission lines and the placing of 26,000 steel pylons. The advantages of standardizing frequency are discussed and the systems adopted for grid tariffs and trading. Much of the information is not readily obtainable elsewhere. A list is included of A.E.S.D. printed pamphlets and other publications written specially for engineering and shipbuilding draughtsmen.

Dutch Colonial Institute

THE "Acht en Twintigste Jaarverslag van het Koloniaal Instituut" gives a brief account of the work of the Dutch Colonial Institute at Amsterdam during the year 1938. Its activities have included public lectures, courses of instruction in tropical hygiene, researches on tropical diseases such as yellow fever and psittacosis, studies in mosquito control and the chemical examination of more than four thousand samples. The valuable work recorded in this year-book gives ample evidence that the Dutch Colonial Institute continues actively to serve the interests of Holland and its oversea possessions.

The Scientific Films Committee

ABOUT two years ago the Association of Scientific Workers set up a Scientific Films Committee, to act as a clearing-house of information on scientific films. During this time it has seen and appraised some 150 films, and has produced a graded list of these films with particulars of length, availability, subject-matter, distributor, etc. This list is available to anyone interested at a cost of 1*s*. If desired, the Committee will undertake, for a small charge, to choose a programme to suit any particular requirements. In addition, the Committee has compiled an index of scientific and film experts willing to be put in touch with people requiring advice on the making of films. Full particulars of the services offered can be obtained from the Secretary, Scientific Films Committee, 30 Bedford Row, London, W.C.1.

Apparatus for the Physical Laboratory

THE twenty-fifth edition of the catalogue of physical laboratory apparatus and equipment recently issued by Messrs. W. and J. George, Ltd., proprietors of F. E. Becker and Co., London and Birmingham, is an impressive volume of 824 pages. The contents cover the whole of the equipment needed for the teaching of physics in all types of educational institution from elementary school to university. For convenience of reference, the catalogue is classified into thirteen sections within which the items are arranged in the usual text-book order of treatment of the subject. Physics is divided into ten sections. The remaining three deal with laboratory fittings, equipment and materials, with lantern slides, ciné films and with text-books. Out-of-date items have been entirely replaced by new apparatus, and the designs of many standard instruments have been improved. In addition to the well-known series of Nivoc products made by Messrs. George, other British and foreign items are included so that every normal requirement in physics teaching is to be found within the covers. But it is more than a mere catalogue. Each item dealing with less well-known apparatus has a brief description of the method of use, together with the necessary theory, supplemented in some of the entries by typical numerical results obtained with the apparatus in the laboratory. Some of these descriptions cover a page or two. The specially drawn illustrations are very clear and project well in the epidiascope. Altogether the catalogue, with its detailed index, corner page headings and numerous cross-references, makes a noteworthy addition to the library of any educational or industrial physics laboratory.

Book Reviews

SIDE by side with the increase in numbers of scientific papers which has been referred to repeatedly in this journal in recent years, there has been a steady if smaller growth of scientific and technical text-books, monographs and other books of interest to readers of NATURE, and the task of presenting to the scientific reader a reasoned survey of such literature has become increasingly difficult in the limited space available. Following the customary practice, longer notices of books have been printed under appropriate titles, while shorter notices have been brought together without a special heading; in addition, a classified list of recent scientific and technical books, whether received for notice in NATURE or not, is printed every month as a supplement to the journal. In the present issue, the shorter notices, which used to appear in the body of the journal immediately after the longer reviews, have been placed in the supplement with the books list. By publishing these shorter notices once a month in this way, it is possible to arrange them according to subject and it is also hoped to increase the total amount of space given to such notices. For the convenience of those who wish to bring the books lists together when binding up a volume, the list

(*Continued on page* 199).